

IN THE CLAIMS

Please amend the claims as follows.

-
1. (Currently Amended) An apparatus ~~Apparatus~~ for edge detection, comprising:
- means for receiving an image signal;
 - first means for ~~first~~ detecting whether a second derivative of the image signal crosses zero;
 - second means for detecting, in response to a positive result from the first means for detecting, ~~second detecting~~ whether a first derivative of the image signal is greater than a first threshold;
 - third means for detecting, in response to a positive result from the second means for detecting, ~~third detecting~~ whether an indication of an edge frequency ~~is~~ meets a predetermined criterion; and
 - means for supplying an edge identification in response to a positive result from the third means for detecting.

2. (Currently Amended) The apparatus of claim 1, wherein:

- the image signal comprises a luminance signal;
- the indication of the edge frequency is a ratio between a third derivative of the luminance signal and a first derivative of the luminance signal; and
- the predetermined criterion is whether the ratio is greater than a threshold.

CI
CON- 3. (Original) The apparatus of claim 2, wherein the third derivative is low-pass as a result of being calculated from a low-pass second derivative.

4. (Original) The apparatus of claim 1, wherein the image signal results from a vertical scan of an image, and the edge identification corresponds to a horizontal edge.

5. (Original) The apparatus of claim 1, wherein the image signal results from a horizontal scan of an image, and the edge identification corresponds to a vertical edge.

6. (Original) The apparatus of claim 1, wherein the image signal comprises a luminance signal and the second derivative is a low-pass second derivative.

7. (Original) The apparatus of claim 1, wherein the image signal is a luminance signal and the first derivative is a low-pass first derivative.

8. (Currently Amended) The apparatus of claim 1, ~~comprising wherein the~~
means for receiving, first means for detecting, second means for detecting, third means for detecting,
and means for supplying comprise a computer readable medium ; readable by a data or signal
processing device, embodying code adapted to effect the ~~listed~~ operations.

CI
CDN-1 9. (Currently Amended) The apparatus of claim 1, ~~comprising wherein the~~
means for receiving, first means for detecting, second means for detecting, third means for detecting,
and means for supplying comprise at least one ~~special-purpose~~ hardware unit adapted to perform the
~~listed~~ operations.

10. (Currently Amended) The apparatus of claim 9, ~~further comprising wherein~~
the at least one hardware unit comprises a separate respective ~~special-purpose~~ hardware unit adapted
to perform each of the detecting operations.

11. (Original) The apparatus of claim 1, wherein the image is a video image and the
image signal is a luminance signal.

12. (Original) The apparatus of claim 1, wherein the second derivative is a low pass
second derivative resulting from a convolution between a second derivative operator and an operator
corresponding to a low pass filter.

13. (Currently Amended) The apparatus of claim 12, wherein the operator corresponding to the low pass filter is of the form $[1, 2, \dots, m, \dots, 2, 1]$, where m is an integer variable relating to an up-scaling factor applied to the ~~video~~ image signal prior to edge detection.

14. (Currently Amended) The apparatus of claim 13, wherein an operator corresponding to the low pass second derivative is of the form $[-1, 0, 0, 0, 2, 0, 0, \underline{0}, -1]$.

CI
cont
15. (Previously Presented) The apparatus of claim 1, wherein the first derivative is a low-pass derivative resulting from a convolution between a derivative operator and an operator corresponding to a low pass filter.

16. (Original) The apparatus of claim 1, further comprising an edge linking unit.

17. (Currently Amended) An image ~~Image~~ processing apparatus, comprising:

- an input for receiving an image related signal;
- a means for effecting a combined low pass filter and derivative operation on the image related signal, without separating the two operations; and
- an output for providing a result of the combined low pass filter and derivative operation.

18. (Original) The apparatus of claim 17 wherein the derivative is a second derivative.

19. (Original) The apparatus of claim 18, wherein the derivative is a first derivative.

20. (Currently Amended) A method for edge detection, comprising the steps of
~~executing the following operations in a data or signal processing device:~~

- receiving an image signal;
- performing a first detection detecting whether a second derivative of the image signal crosses zero;
- in response to a positive result from the first detection detecting, performing a second detection detecting whether a first derivative of the image signal is greater than a first threshold;
- in response to a positive result from the second detection detecting, performing a third detection detecting whether an indication of an edge frequency meets a predetermined criterion; and
- supplying an edge identification in response to a positive result from the third detection detecting.

21. (Original) The method of claim 20, wherein
- the image signal comprises a luminance signal;
 - the indication of the edge frequency is a ratio between a third derivative of the luminance signal and a first derivative of the luminance signal; and
 - the predetermined criterion is that the ratio is greater than a threshold.
22. (Original) The method of claim 21, wherein the third derivative is low-pass as a result of being calculated from a low-pass second derivative.
23. (Original) The method of claim 20, wherein the image signal results from a vertical scan of an image, and the edge identification corresponds to a horizontal edge.
24. (Original) The method of claim 20, wherein the image signal results from a horizontal scan of an image, and the edge identification corresponds to a vertical edge.
25. (Original) The method of claim 20, wherein the image signal comprises a luminance signal and the second derivative is a low-pass second derivative.
26. (Original) The method of claim 20, wherein the image signal is a luminance signal and the first derivative is a low-pass first derivative.

27. (Currently Amended) The method of claim 20, ~~comprising effecting the~~
~~operations in response to a medium, readable by the data or signal processing device and embodying~~
~~code~~ wherein the steps are performed by code embodied on a computer readable medium.

C1
CON- 28. (Currently Amended) The method of claim 20, ~~comprising effecting the~~
~~operations in at least one special purpose~~ wherein the steps are performed by at least one hardware
unit.

29. (Currently Amended) The method of claim 29 20, wherein the at least one
~~special purpose~~ hardware unit comprises a separate respective ~~special purpose~~ hardware unit adapted
to perform each of the detecting steps ~~operations~~.

30. (Original) The method of claim 20, wherein the image is a video image and the
image signal is a luminance signal.

31. (Original) The method of claim 20, wherein the second derivative is a low pass
second derivative resulting from a convolution between a second derivative operator and an operator
corresponding to a low pass filter.

32. (Currently Amended) The method apparatus of claim 31, wherein the operator corresponding to the low pass filter is of the form $[1, 2, \dots, m, \dots, 2, 1]$, where m is an integer variable relating to an up-scaling factor applied to the ~~video~~ image signal prior to edge detection.

C1
CDN- 33. (Currently Amended) The method of claim 32, wherein an operator corresponding to the low pass second derivative is of the form $[-1, 0, 0, 0, 2, 0, 0, \underline{0}, -1]$.

34. (Currently Amended) The method apparatus of claim 20, wherein the first derivative is a low pass derivative resulting from a convolution between a derivative operator and an operator corresponding to a low pass filter. ~~The apparatus of claim 12, wherein the low pass filter is of the form $[1, 1, \dots, 1]$.~~

35. (Currently Amended) The method of claim 20, further comprising ~~an edge~~ linking at least two identified edges unit.

36. (Currently Amended) An image ~~Image~~ processing method, comprising the
steps of executing the following operations in a data processing device:

- receiving an image related signal;
- effecting a combined low pass filter and derivative operation on the image related
signal, without separating the two operations; and
- providing a result of the combined low pass filter and derivative operation.

37. (Original) The method of claim 36, wherein the derivative is a second derivative.

38. (Original) The method of claim 36, wherein the derivative is a first derivative.

39. (Currently Amended) An edge ~~Edge~~ detection apparatus, comprising:

- an input adapted to receive an image signal;
- a processing apparatus adapted:
 - to detect at least one edge having higher frequency content in the image signal
and at least one edge having lower frequency content; and
 - to distinguish the edges having higher frequency content from the edges
having lower frequency content; and
- an output arranged to supply an edge detection indication only in response to the
edges having higher frequency content.

40. (Currently Amended)

The apparatus of claim 12, wherein the low pass filter is

of the form $[1, 1, \underline{1}, \dots, 1]$.